Animal welfare index – why and how?

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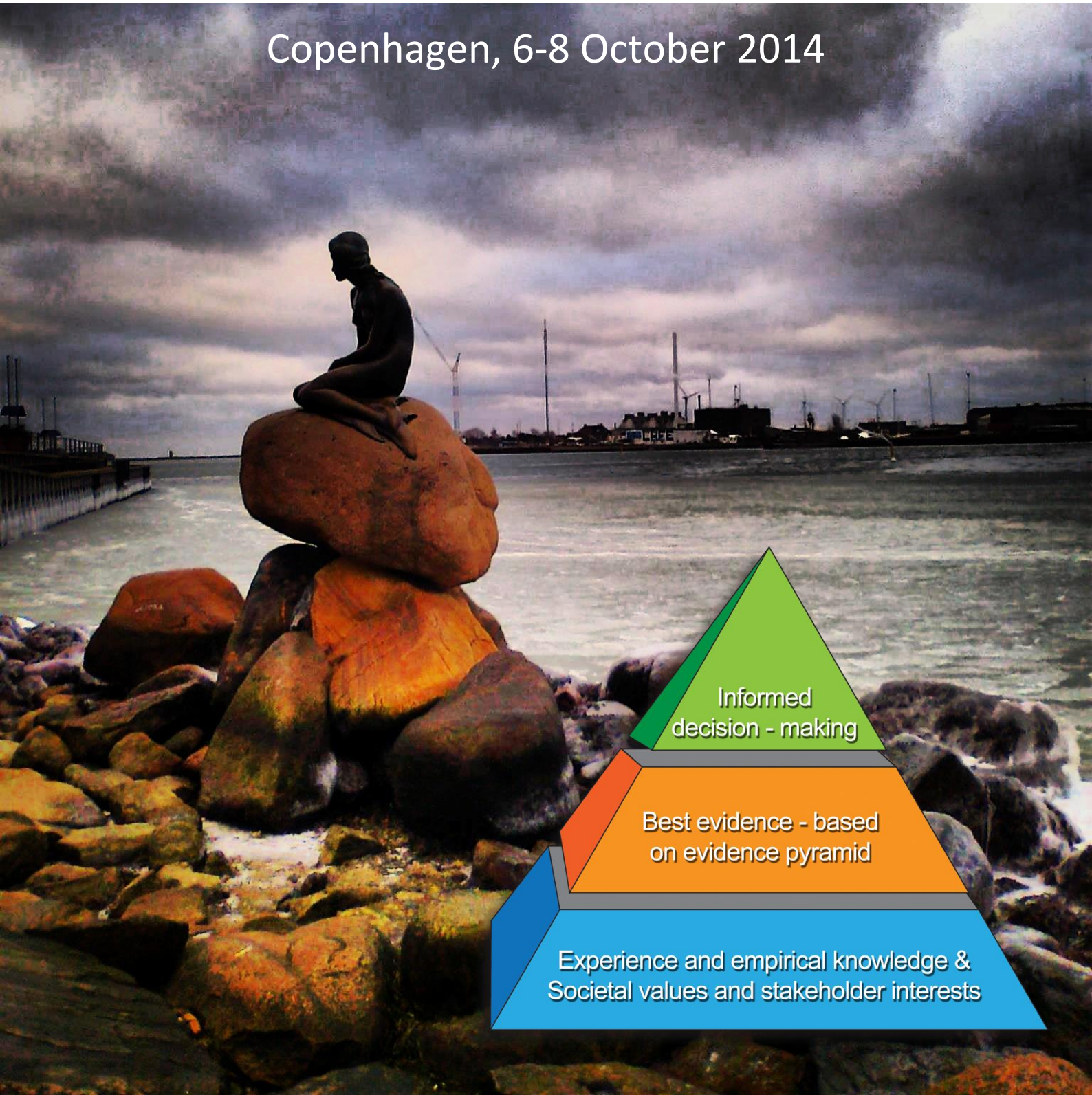
Annual Scientific Conference and **Annual General Meeting** of the **European College of Veterinary Public Health**

Evidence-informed decision-making within Veterinary Public Health

Copenhagen, 6-8 October 2014



Proceedings of the Annual Scientific Conference and the Annual General Meeting of the European College of Veterinary Public Health, 6-8 October 2014, University of Copenhagen, Copenhagen, Denmark.

Editor: Søren Saxmose Nielsen, University of Copenhagen

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17:00-20:00	Registration open	Hotel Skt. Petri (address: Krystalgade 22, 1172 Copenhagen)
18:00-22:00	Networking and standing dinner	Hotel Skt. Petri

Tuesday, 7th of October

06:30-07.30	*Run-and see*	*Guided morning run*
8:30-9:00	Registration at the Ceremonial Hall	University of Copenhagen Ceremonial Hall
09:00-09:05	Welcome by Marcello Trevisani	Ceremonial Hall
9:15-10.15	'**How to perform evidence-informed policy making**' by keynote speaker Per Henriksen, CVO of Denmark 30 min keynote lecture 30 min **discussion**	Chair: Marcello Trevisani Discussion moderator: Stuart Reid, RVC
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14:15-14:45	**Presentation of 2 joint resident projects**: Torben Nielsen: Meat inspection JRP (15 min) Laura Falzon: New JRP (15 min)	Chair: Jeroen Dewulf
	Antibiotic use and resistance	Chair: Jeroen Dewulf
14:45-15:25	'**Antibiotic use and resistance – state of the art**' by keynote speaker Luca Guardabassi, UCPH (30 min lecture + 10 min questions)	
15:25-16:00	Coffee break + poster viewing	
16:00-17:00	**Debate on control of antimicrobial resistance** Opponents: Koen Mintiens (BoerenBond, Belgium) and John Elmerdahl Olsen (Univ. Copenhagen)	Chair: Jeroen Dewulf Facilitator: Jeroen Dewulf
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09:30-10:00	**'The societal environment and perception of risk management – a social science perspective'** by keynote speaker Janus Hansen, Dep. of Social Sciences, UCPH	
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11:15-13.00	**Animal Welfare**	Chair: Ed van Klink
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11:45-12:15	'**Animal welfare at slaughter: In theory**' – keynote speaker Bo Algers, SLU (30 min)	
12:15-12:45	'**Animal welfare at slaughter: In practice** – keynote speaker Bert Urlings, VION Food	
12:45-13:00	**Discussion**	
13:00-13:30	Presentation of **next year's venue** **Poster prize and goodbye**	
13:30-14:00	**Lunch**	

15:30-17:00	**Tour to the United Nations building** **For ECVPH Residents** **Pickup outside UN building at 15.30** Find your own way to the UN Island	WHO, UN Island, Marmorvej 51 Coordinator: Anna Fahrion
15:45-17:00	**Tour at the UN building**	

Thursday, 9th of October, 09:00-16:30

Resident workshops at UCPH campus in Frederiksberg

Workshop 1
Source attribution methods: typing of antibiotic resistant bacteria and outbreak modeling
By Tine Hald and Sarah Pires from Technical University of Copenhagen, and Valeria Bortolaia and Peter Damborg, from University of Copenhagen

Venue: "Orangeriet", Small Animal Hospital, Frederiksberg Campus, University of Copenhagen

Workshop 2
Diagnostic test evaluations with and without reference standards
By Søren Saxmose Nielsen, University of Copenhagen and Nils Toft, Technical University of Denmark

Venue: Section for Animal Welfare and Disease Control, Grønnegårdsvej 8, Frederiksberg Campus, University of Copenhagen

Friday, 10th of October, 09:00-13:00

Resident workshop at Danish Agricultural and Food Council, Axelborg

Workshop 3
Monitoring and control program for use of antimicrobials in livestock in Europe
By Erik Jacobsen, Annette Cleveland Nielsen from the Danish Veterinary and Food Administration, and Elisabeth Okholm Nielsen and Lis Alban from the Danish Agricultural and Food Council

12:30-13:00: Lunch at DAFC
13:00: Goodbye

2. Presidential foreword

The annual conference of the European College of Veterinary Public Health is held this year at the Ceremonial Hall of the University of Copenhagen during 6-8 October 2014. The local organising committee is composed of ECVPH diplomates working in Denmark that provided their generous support for this event. They also have organized three workshops for a number of graduated veterinarians who applied for the ECVPH Resident Training Programme (residents), thus giving them the opportunity to gain professional knowledge on the monitoring and control programmes for use of antimicrobials in livestock, typing of antibiotic resistant bacteria and outbreak modelling and the evaluation of diagnostic tests that are useful for them.
The annual conference gives to all diplomates and the residents the chance to meet and become involved in the activities of the College. The diplomates should give their contributions to promote the communication and dissemination of knowledge and to improve the quality of the service to the public. We wish that the diplomates will be stimulated by the talks of experts and the reports on ongoing current research carried out by the residents. We need that all participants will contribute to the discussing bringing their own experience.
The ECVPH is also a network of professional specialists that can provide support for collaborative projects. Given the rapidity with which science is advancing in all of the areas covered by ECVPH, we encourage the diplomats to be stimulated by the multidisciplinary team working and be active in the education of future diplomates.

Marcello Trevisani
ECVPH President

3. Programme preface

The theme of this year's meeting 'Evidence-informed decision-making within Veterinary Public Health' is ambitious. The concept 'Evidence-informed' not only refers to that decisions should be based on updated scientific knowledge, but also that the evidence should be integrated with the individual expertise and the needs in the specific context.
With this focus we cover several important professional areas within Veterinary Public Health such as antibiotic use and resistance, surveillance of emerging zoonotic infections, risk management and assessment of animal welfare in the primary production and at slaughter.
The topics are covered from the view of national and international stakeholders presenting policy making and methodologies for surveillance and risk assessment, by state of the art lectures as well as lectures on practical view points and finally also presentation of specific projects.
Structured debates with facilitators and opponents followed by audience votes on controversial statements will challenge whether we are using the best evidence-informed decision making in our current responses to urgent threats such as antibiotic resistance in Europe.
It is our hope that the meeting will illustrate that collaboration between several scientific disciplines both within natural and social sciences as well as within humanities are needed to cope with the current challenges in Veterinary Public Health. And furthermore that in decision making the scientific evidence never stands alone, but must be integrated with expertise on the settings and contexts of the real world.

The Local Organizing committee

Lis Alban, Danish Agricultural and Food Council
Liza Rosenbaum Nielsen, Department of Large Animal Sciences, University of Copenhagen
Søren Saxmose Nielsen, Department of Large Animal Sciences, University of Copenhagen
Luca Guardabassi, Department of Veterinary Disease Biology, University of Copenhagen
Hans Houe, Department of Large Animal Sciences, University of Copenhagen
Peter Damborg, Department of Veterinary Disease Biology, University of Copenhagen
Jens Frederik Agger, Department of Large Animal Sciences, University of Copenhagen
Anna Fahrion, Regional Office for Europe, World Health Organization.

4. Sponsors

5. Abstracts

5.1. Evidence-informed policy-making

How to perform evidence-informed policy making

Per Henriksen, CVO, Danish Veterinary and Food Administration, Glostrup, Denmark

The Danish Veterinary and Food Administration, DVFA, deals with food health and safety issues from farm to fork and with animal health and welfare issues. The head office based in Glostrup, Copenhagen handles development, co-ordination and the formation of rules and regulations as well as servicing the Ministry of Food, Agriculture and Fisheries.

To ensure a transparent and evidence-informed process for policy making, for revising existing legislation and for drafting new legislation, scientific knowledge in the form of reviews, opinions and actual research projects are regularly asked for and used by the Danish authorities.

To ensure that the scientific knowledge is objective, of the right quality and available at the right time, the Ministry of Food, Agriculture and Fisheries has signed research consultancy service contracts with the Danish universities including Aarhus University, University of Copenhagen and the Technical University of Denmark.

The research consultancy service contracts require that universities should both be able and be ready to advise the Danish Ministry of Food, Agriculture and Fisheries and the DVFA when needed and thus it is expected that the universities draw on nationally and internationally recognised scientific results.

The research-based consultancy services are requested in a broad range of areas spanning f. inst. the areas of veterinary sciences, food sciences, organic agriculture, food safety, food quality, livestock and crop science.

Denmark has a tradition for developing strategies and action plans, for example for the control of zoonoses, in cooperation with the industry and relevant research institutes. This cooperation ensures that science, feasibility, practical experience and relevant regulation are combined. The plans and strategies are followed and adjusted when new knowledge or a new situation occurs.

This presentation will present and illustrate – with some recent examples - the process for evidence-informed policy-making in a Danish context.

Evidence-based policy-making related to food safety - a WHO perspective

Hilde Kruse, DVM, PhD, Programme Manager Food Safety, WHO Regional Office for Europe

WHO is the directing and coordinating authority for health within the United Nations system. It is responsible for providing leadership on global health matters, shaping the health research agenda, setting norms and standards, articulating evidence-based policy options, providing technical support to countries and monitoring and assessing health trends. The work-plan of WHO is developed based upon a dialogue between WHO and the Member States. Available evidence represents an essential part of the priority-setting. The current talk will focus on evidence-based policy-making related to food safety and zoonoses.

In the WHO Twelfth General Programme of Work 2014-2019, "Food safety" is recognized as a specific area of work (5.4.) under Category 5 "Preparedness, surveillance and response". The aspiration outcome is that "All countries are adequately prepared to prevent and mitigate risks to food safety". The food safety work-plan is aligned with the WHO "Strategic Plan for Food Safety including Foodborne Zoonoses 2013-2022", which provides a coherent framework for taking action on priority issues in the area of food safety and zoonoses. The overall mission is: To lower the burden of foodborne disease, thereby strengthening the health security and ensuring sustainable development of Member States.

The current food safety work-plan in WHO is developed in order to achieve three major outcomes:

- Support the work of the Codex Alimentarius Commission to develop, and for countries to implement food safety standards, guidelines and recommendations
- Multisectoral collaboration to reduce foodborne public health risks, including those arising at the animal–human interface
- Adequate national capacity to establish and maintain risk-based regulatory frameworks to prevent, monitor, assess and manage foodborne and zoonotic diseases and hazards.

The Codex Alimentarius Commission, the joint FAO/WHO food standards programme, sets standards for foods in international trade to ensure health protection for consumers and facilitate trade. Codex standards are the benchmark for foods in international trade under the World Trade Organizations' Agreement on Sanitary and Phytosanitary measures (SPS-agreement). Codex standards are based upon scientific risk assessment that is provided by WHO in collaboration with FAO. Crucial to developing risk assessment is the access to reliable national data on the incidence of foodborne disease and the occurrence of food contamination as well as a better understanding of the health burden of diseases related to foodborne risks.

Evidence shows that intersectoral and interdisciplinary collaboration is crucial for prevention and control of foodborne and zoonotic diseases and for cost-efficient and successful interventions. WHO is closely working with FAO and OIE in the response to public health risks arising at the human-animal interface, and we are encouraging countries to ensure efficient intersectoral collaboration and information-sharing at the national levels. Furthermore, "Health 2020 - the European policy for health and well-being" underlines that expanding interdisciplinary and intersectoral collaboration between human, environmental and animal health enhances public health effectiveness.

As one example, antimicrobial resistance is a priority in WHO due to the wealth of evidence showing that this represents a major global public health threat. In 2011, the Regional Committee for WHO/Europe endorsed the European Strategic Action Plan of Antibiotic Resistance, which includes

the following action area: “Prevent and control the development and spread of antibiotic resistance in the veterinary and agricultural sectors”. WHO is working closely with countries to implement this.
In the Russian-speaking and Balkan sub-regions of Europe, there is a great need for support and capacity building in the food safety and zoonotic area. The WHO work is focused on influencing the strategies and policies to become more holistic, intersectoral, risk-based and aligned with current available evidence.
The areas of work include:

- Facilitating involvement in Codex Alimentarius work
- Strengthening the surveillance of foodborne disease
- Strengthening the monitoring of chemical and microbiological food contamination in the food chain
- Addressing antimicrobial resistance from a food safety perspective
- Strengthening food safety emergency and outbreaks preparedness and response
- Improving food safety risk communication

5.2. Selected residents presentations

PR1: What is the profile of the top 60 pig farmers with the best technical performances and lowest antimicrobial usage?

Lucie Collineau, M. Postma, C. Belloc, J. Dewulf, V.H.M. Visschers, D. Iten, A. Backhans, M. Sjölund, U. Emanuelson, A. Lindberg, E. grosse Beilage, S. Loesken, K. Stärk on the behalf of the MINAPIG Consortium*

An increasing number of studies have shown that the development and spread of antimicrobial resistance is partly related to the usage of antimicrobials in animals. Because many management factors can impact on antimicrobial usage on a farm, it is difficult to identify individual factors that are consistently and strongly correlated with reduced antimicrobial use. As a first step in that direction, the objective of this study was to describe the profile of the top 60 pig farmers from four European countries with the best technical performances and lowest antimicrobial usage. A retrospective study was conducted in 2013 among 231 farrow-to-finish pig farmers from Belgium, France, Germany and Sweden. Farm visits aimed to describe the antimicrobial usage over the past year, the internal and external biosecurity levels and the farm technical performances. Additionally, participants were asked to complete a paper-based questionnaire that investigated their attitudes and perceptions of antimicrobial usage and resistance, including a self-evaluation of their own antimicrobial consumption. We first identified the best approach to select the top 15 farmers from the four countries (60 farmers in total), i.e. those that had the lowest antimicrobial usage and the best technical performances. We then described their biosecurity levels and their attitudes/perceptions in comparison with the other farmers from our sample. The study analysis is still ongoing and preliminary results will be available at the ECVPH annual meeting. This study was part of the MINAPIG Consortium (http://www.minapig.eu/) activities that aim to provide the foundation for an integrated understanding of technical and psychological factors driving decisions of farmers and veterinarians about pig health and production, particularly the use of antimicrobials.

PR2: Experience with in-line detection of boar taint

Lourens Heres, J. van Riel, R.E. Klont, H.A.P. Urlings*

The fattening of entire male pigs is an improvement for animal welfare and saves environmental resources. To enable fattening of entire males, companies that slaughter entire male pigs should be able identify and separate carcasses that have the typical boar taint. Since 2010, an in-line human nose scoring method was developed and implemented in slaughterhouses in The Netherlands and Germany. This method is based on heating of neck fat and smelling of the odour by trained testers. To validate the method, routine data and experimental data were collected. Over 1.5 million records from testing in 2012 and 2013 in one slaughterhouse were used. Testing was done at a line speed of 650 carcasses per hour. These data were used for multivariable statistical evaluation. In addition, some experiments were done to validate specific parts of the testing method. The data from routine testing shows that 3.3% of the entire male carcasses were classified as having boar taint. The proportion of tainted boar carcasses is positively correlated with fat thickness. The effect of slaughter weight is limited. There was a strong farm effect on the presence of boar taint. The data show that testers can evaluate 1,000 boars per day, if they rest properly between testing session of maximum 30 minutes. Neck-fat is used to evaluate the smell of the entire carcass. Androstenon and Skatol analyses of neck-fat, belly fat and ham fat show that there is no meaningful difference in the concentrations for these main boar taint

compounds in these different parts of the carcass. In the sensory at-line evaluation of boar taint in fat of these three parts, no differences were found. The assessment of sensitivity, specificity, and robustness of the test procedure, confirms that in-line testing of entire male pig carcasses is a valid method for boar taint detection.

PR3: Implementing visual meat inspection of domestic pigs in Finland

Riikka Laukkanen-Ninios, R. Rahkila, L. Oivanen, M. Fredriksson-Ahomaa*

Post-mortem inspection of domestic pigs was revised by Commission Regulation (EU) No 219/2014 into visual inspection with additional post-mortem inspection procedures using incision and palpation if possible risk to public health, animal health or animal welfare is indicated. Therefore, Finnish Food Safety Authority Evira prepared guidance on how to implement post-mortem inspection of domestic pigs based on this new legislation. To facilitate the preparation of the guidance, a short questionnaire for the official meat inspection personnel and to a selection of production animal pathologists was sent to collect an opinion on when additional post-mortem inspection procedures are needed. The applicability of visual meat inspection in practice, frequency for hand washing and possibility to trim red offal on the side track or elsewhere out of slaughter line were also queried. The total response rate was limited, 33 of 123 (27 %) receivers of the questionnaire. 27 out of these respondents (82 %) either worked or had experience in working at a pig slaughterhouse. The responses represented 5 out of 9 large scale slaughterhouses that slaughter pigs. None of the meat inspection personnel considered visual inspection of all parts of pigs possible. At least touching of the part under inspection was considered necessary. The opinion of veterinarians and official auxiliaries differed significantly only on inspection of umbilical region and joints of young animals. The most common preliminary diagnoses for which additional post-mortem procedures were needed consisted of local infections of the inspected part, systemic infection and tumors. Atypical mycobacteria were the most commonly mentioned microbes. Over 35% of the respondents considered hand washing impossible after each carcass and red offal. Only 26% of the respondents considered trimming of partially condemned red offal possible on a side line or elsewhere out of slaughter line.

PR4: Association between microbiological and serological prevalence of human pathogenic *Yersinia enterocolitica* in pigs and pig batches

Gerty Vanantwerpen, I. Van Damme, L. De Zutter, K. Houf*

Pigs are the main reservoir of *Y. enterocolitica*, and the microbiological and serological prevalences of this pathogen differ between farms. The infection status of pig batches arriving at the slaughterhouse is largely unknown. Moreover, information about a possible link between the presence of *Y. enterocolitica* bacteria and the presence of antibodies is missing. Understanding the association between the microbiological and serological prevalence could help to predict the contamination of the pigs prior to slaughter. Pigs from 100 different farms were sampled at the abattoir. Tonsils and pieces of diaphragm were collected from 7,047 pigs (on average 70 pigs per batch). The tonsils were analyzed using a direct plating method and confirmed with a multiplex Polymerase Chain Reaction (*ail, yst, virF*). When at least one colony was detected, the sample was indicated as positive. The meat juice of the pieces of diaphragm was analyzed by Enzyme Linked ImmunoSorbent Assay Pigtype Yopscreen (Labor Diagnostik Leipzig, Qiagen, Leipzig, Germany). A used cut-off of the activity value was 30 OD%. The results of these prevalences were compared using a mixed-effects logistic regression at pig and

batch level. *Yersinia enterocolitica* was found in 2,009 pigs, of which 1,872 also had antibodies against *Yersinia* spp. A total of 2,820 pigs possessed antibodies without positive microbiology. According to the logistic regression, the microbiological contamination could not be predicted by the presence of antibodies at pig level. At batch level, an association was observed (microbiological prevalence $=0.444/(1-e^{-0.063*(\text{activity value}-37.069)})$), which means that a batch is positive in microbiological testing, when its mean activity value is more than 37 OD%). The given formula could predict whether a pig batch contained infected pigs before they arrived at the slaughterhouse. This way infected batches could be slaughtered last so cross-contamination in the slaughterhouse could be avoided or diminished.

5.3. On-going Joint Resident Projects (JRP)

Hygiene practices to control faecal contamination of pig carcasses in European abattoirs

*Participants: Florence Ayral, Julie Bare, Peter Damborg, Christina Nathues, Carole Peroz, Angelika Schoster, Franziska Wolfender, Gherrit koop, Torben Nielsen**

EU is currently focusing on controlling salmonella and reducing the risk of foodborne diseases. In this joint residents project a questionnaire was developed and used to describe what measures are taken by abattoirs in different European countries in order to avoid faecal contamination of pig carcasses. In total, 12 questionnaires were filled in by abattoirs from 5 different countries. Currently, the answers are being summarised and incorporated into a manuscript. The presentation at the ECVPH annual meeting will concentrate on experiences from the project and suggestions for future projects.

The quantitative benefit of a "one health" approach: A systematic review

Participants: Laura C. Falzon, Ilias Chantziaras, Lucie Collineau, Aurélie Courcoul, Marilena Filippitzi, Riikka Laukkanen-Ninios, Isabel Lechner, Carole Peroz, Jorge Pinto Ferreira, Merel Postma, Pia G. Prestmo, Clare Pythian, Eleonora Sarno, Gerty Vanantwerpen, Timothée Vergne, Douglas Grindlay, Marnie Brennan*

The "One Health" concept describes a multi-disciplinary approach to address complex issues with high value loads and societal stakes. While several research groups and academics have advocated in favour of this approach, the benefit of using this approach needs further investigations. Therefore, this joint resident project aims to systematically review primary research investigating complex health issues, to quantify the benefit of adopting a One Health approach. The project was initiated at the ECVPH Annual Meeting in Turin, 2013.

5.4. Antimicrobial use and resistance

Antimicrobial use and resistance in livestock – state of the art

Luca Guardabassi, DVM, PhD, ECVPH diplomate, Department of Veterinary Disease Biology, Faculty of Health and Medical Sciences, University of Copenhagen

Through the years, use of antimicrobials in livestock has been the subject of an endless debate about the appropriateness of using these important medicines in animals. This is a highly controversial topic involving ethical issues on animal welfare and human health, as well as economic interests by the pharmaceutical industry, the food industry and various professional categories, including farmers, veterinarians, pharmacists and researchers. As a consequence of all these factors, the debate has been often vigorous but not always scientifically unbiased. The aim of this lecture is to review the state-of-the-art with focus on three key issues regarding the public health risks derived from antimicrobial use in livestock and the possible options to mitigate such risks.

Which resistant bacteria in livestock may be regarded as a threat to public health?
The public health risks associated with zoonotic transmission of resistant bacteria are highly dependent on the bacterial species and the type of resistance involved. Historically, the main risks have been associated with foodborne pathogens such as *Salmonella* and *Campylobacter*. However, the public health burden attributable to antimicrobial resistance in these species is limited, since infections are generally self-limiting and, in most cases, managed without antimicrobial therapy. Of higher concern is the recent emergence in livestock of extended-spectrum β-lactamase (ESBL)-producing *Escherichia coli* and livestock-associated methicillin-resistant *Staphylococcus aureus* (LA-MRSA). These multidrug-resistant bacteria may have a considerable impact on human mortality and healthcare costs as they are by definition resistant to cephalosporins, which are first-line agents in the therapy of severe *E. coli* and *S. aureus* infections. Based on the current knowledge, zoonotic transmission of ESBL-producing *E. coli* appears to be more insidious and difficult to assess and control compared to LA-MRSA.

What is the relative contribution by livestock to antimicrobial resistance problems in human medicine?
One of the present challenges is to assess the public health burden of LA-MRSA, ESBL-producing E coli and other resistant bacteria or resistance genes of animal origin. This assessment is made difficult by the lack of data, and even more by the fact that transmission of antimicrobial resistance is a complex and largely unpredictable phenomenon involving different routes and mechanisms of transmission. This exercise is partly facilitated for LA-MRSA, since these bacteria can be distinguished from MRSA of human origin and are primarily transmitted by exposure to livestock. Until now, the proportion of human MRSA infections due to LA-MRSA appears to be low in most countries. However, LA-MRSA is regarded as a serious occupational health hazard and a threat to the sustainability of the national "search and destroy" control policies in countries with low prevalence of human MRSA infections and high density of pig production, such as the Netherlands and Denmark. The burden of human ESBL infections attributable to animal sources is extremely difficult to quantify and remains poorly assessed to date.

How can the risk of zoonotic transfer be managed?

Transmission of antimicrobial resistance can be controlled in two ways: by reducing antimicrobial use or by preventing transmission of resistant bacteria from livestock to humans. Measures reducing antimicrobial use in livestock have been demonstrated to be effective in several circumstances and form the basis of the current EU strategic action plan to prevent and control development and spread of antimicrobial resistance in the agricultural sector. However, antimicrobial use is not the only driving force promoting spread of resistant bacteria in animal populations and food products, as clearly indicated by the recent spread of ESBL-producing *E. coli* in broiler meat. Control of antimicrobial use alone might not always lead to conclusive results since the spread and persistence of multidrug-resistant bacteria is favoured by complex mechanisms of evolution and co-selection. Thus, a holistic approach going beyond the control of antimicrobial use and including development of innovative pre-harvest and post-harvest solutions is needed. Moreover, the problem should be tackled on a global scale since any national efforts will be scarcely effective in the absence of international legislation and coordination to control trade of food products and living animals carrying resistant bacteria of zoonotic concern.

5.5. Risk surveillance, management and perception

Indicator- and event-based surveillance for detection and assessment of emerging zoonotic infections

Céline Gossner[1,2]; Johanna Takkinen[1]; [1]European Centre for Disease Prevention and Control (ECDC), Stockholm, Sweden; [2]Maastricht University Medical Center (MUMC+), Maastricht, The Netherlands

1. Background

As part of its mandate, the European Centre for Disease Prevention and Control (ECDC) identifies, assesses and communicates current and emerging threats to human health posed by infectious diseases. More specifically, ECDC aims to improve surveillance, to strengthen laboratory capacity and to ensure the early detection and response to international outbreaks. Fifty-two diseases or specific health issues (like antimicrobial resistance) are subject to notification from the countries to the European level[1,2].

To achieve its mission, ECDC relies on a wide range of disease specific networks of experts, mainly epidemiologists and microbiologists, from European Union (EU) and European Economic Area (EEA) Member states. Among those networks, we can cite the Food- and Waterborne Diseases and zoonoses Network (FWD-Net), the European Creutzfeldt Jakob Disease surveillance network (EuroCJD); the Emerging and Vectorborne Diseases network and the Influenza network.

As 75% of the emerging diseases have a zoonotic origin, ECDC is closely collaborating with the food and animal health sectors including the European Food Safety Authority. ECDC has established a close relationship with partners outside the European Union, including the World Health Organization and the United States Centers for Disease Control.

2. Detection and assessment of emerging zoonotic infections

2.1 Indicator-based surveillance for emerging zoonotic infections

Since 2007, ECDC is collecting human case-based or aggregated data from the EU and EEA Member States on 21 zoonotic infections through The European Surveillance System (TESSy). The data is collected annually for most diseases providing background epidemiological data and trends, but not allowing rapid detection of multi-country outbreaks. However, salmonellosis and Shiga Toxin – producing Escherichia coli (STEC) infections are reported quarterly while influenza and West Nile fever infections weekly.

ECDC launched in 2012 a project for European molecular typing-based surveillance of human Listeria, Salmonella and pathogenic Escherichia coli infections. The system aims to detect multi-country clusters and outbreaks by timely collection of molecular typing results of human isolates and to establish a centralised database of typing patterns.

2.2 Event-based surveillance of emerging zoonotic infections

In March 2010, ECDC launched a restricted web-based communication platform named the Epidemic Intelligence Information System (EPIS) bringing together multidisciplinary experts to ensure the early detection and coordination of the investigation of international outbreaks through the timely sharing of cross-sectorial information. EPIS is divided in thematic modules including a foodborne infections

[1] Commission Decision 2119/98/EC of the Parliament and of the Council of 24 September 1998 setting up a network for the epidemiological surveillance and control of communicable diseases in the Community. 1998, Official Journal of the European Union. p. L268.

[2] Commission Decisions 2000/96/EC, 2003/534/EC and 2007/875/EC of the Parliament and of the Council

(EPIS-FWD) module. ECDC is currently considering developing a module for emerging and vector-borne disease.

EPIS allows participating countries to timely report usual increases in number of cases and to verify if other Member States are observing the same situation. In 2013, ECDC assessed 42 events reported through EPIS-FWD among which 12 were multi-country outbreaks.

2.3 Assessment of the threats

The assessment of the public health threats is made daily by ECDC experts. In case of verified multi-country events (emerging risk or outbreak), a rapid risk assessment is prepared in consultation with the public health authorities in the affected Member States, and with EFSA in case of a zoonotic outbreak. The operational guidance on rapid risk assessment methodology was developed to support this activity. In 2013, ECDC produced 23 rapid risk assessments, out of which nine were on zoonotic infections.

3. Conclusion

By combining indicator- and event-based surveillance, ECDC is able to timely detect, monitor and assess the emergence of cross-border zoonotic infections in humans in the EU and EEA. Close collaboration with the public health authorities from affected Member States and with the European Food Safety Authority is crucial to ensure a comprehensive threat assessment of events.

The societal environment and perception of risk management – a social science perspective

Janus Hansen, Associate professor and Head of Department, Department of Sociology, UCPH.
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My talk will first introduce the influential sociological thesis suggested by German sociologist Ulrich Beck that we have entered a 'Risk Society'. The RS thesis elaborates on the paradox that on the one hand scientific progress means that we are becoming still better at managing many risks, including risk related to food production. On the other hand, the general public seems more concerned than ever about such risks. This development has induced a loss of confidence in scientific expertise, and sets the scene for many contemporary risk controversies.

I will then move on to discuss the concept of 'risk' in social science perspective in more general terms as a means to deal with the uncertainty of future events.

Following this, I will elaborate on three distinct research approaches to risk perception and risk management in social science research: an 'objectivistic', a 'subjectivistic' and a 'social constructivist' perspective. Each of these approaches suggests different ways of managing risk and risk communication in the public sphere

The 'objectivist' approach is founded on the conventional probabilistic understanding of risk developed in the natural sciences. Here the primary social dividing line is between experts and lay people.

The 'subjectivistic' approach focuses on the particular features of human cognition that give rise to different types of risk being perceived as more or less serious, depending of perceptions of control, responsibility and justice.

The 'social constructivist' approach focuses on the way people have different perceptions of risk and control depending on their location in the social structure and how they are integrated by different social institutions.

Based on a confrontation of the three approaches, I will discuss how we might re-interpret the political dynamic of risk controversies beyond a simple expert – lay dichotomy, and make some suggestions for a more inclusive approach to managing risk controversies in the public realm.

5.6. Animal welfare monitoring

Animal welfare index – why and how?

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As part of a general political desire to improve animal welfare in Denmark, there is a wish to be able to follow the development of animal welfare over time. A political agreement dealing with veterinary issues for the years 2013-2016 stated directly that the development of an animal welfare index would support the action for improved animal welfare. An index has certain properties making it attractive to follow complex traits over time. The word 'index' itself refers to a greater volume of values, data, information or knowledge. Often it is expressed as an 'index number' where the data for a representative group of individuals are summarised over time by comparing to a defined base value of usually 100.

Following the agreement, the project 'Development of animal indexes for cattle and swine herds' was initiated. The project is established as a collaboration between the Danish Veterinary and Food authorities, University of Copenhagen and Aarhus University.

Previous research projects as well as a pilot project on the development of an animal welfare index released in January 2013 concluded that Denmark has a number of register data (e.g. animal movements, meat inspection, medicine consumption and violation of animal welfare legislation) that may be relevant to include in the establishment of an index. However, it is also clear that these register data need to be supplemented with additional on farm measures.

Therefore the major specific objectives to be pursued in order to reach the overall objective of establishing an animal welfare index are to 1) agree on an animal welfare definition and appropriate groupings of ani-mals; 2) Select the relevant resource- and animal based indicators; 3) weight the relevance of individual indicators; 4) aggregate the measures to the herd and national level; 5) Validate the index.

It has been decided to use a welfare definition emphasizing the experiences of the animals and to work with the following animal groups: Dairy cattle; dairy calves; farrowing sows and piglets; gilts and gestating sows; fattening pigs. A list of welfare indicators has been selected based on relevance, feasibility and validity (using literature and expert opinions). A special sub-project will evaluate the use of experts for selection and weighting of indicators. The aggregation procedure will, where possible, include observations and scoring of individual animals, followed by weighting of both indicators and score values and possibly also prevalences. Three indexes will be established: Index 1 based on existing registrations (meat inspection, use of antibiotics etc.); Index 2 based on farm visits, mainly animal based measures; and index 3 being the best combination of 1 and 2. Different mathematical approaches (e.g using arithmetic or geometric means) will be evaluated for use in the final calculation of an index number and to secure that they fulfil certain criterias such as being independent of the basic units of measurement. Finally, a validation will be made using Welfare Quality® score for the separate criteria and principles as the reference values.

The animal welfare index is intended to be implemented on a national scale. For some sub-elements or indicators the implementation will include all herds, whereas it for other elements will include a representative and sufficient subsample of herds.

The animal welfare index is expected to be valuable as a benchmarking and communication tool.

Animal welfare at slaughter: In theory

Bo Algers, Professor, Department of Animal Environment and Health, Swedish University of Agricultural Sciences, 53223 Skara, Sweden.

Slaughter of animals most commonly involves the following critical steps; loading, transport, unloading, driving to lairage, lairage, driving to stunning, stunning and debleeding. Several welfare problems commonly occur due to e.g. poor driving methods, poor vehicle design, poor driving logistics, poor abattoir facilities and unfavourable stunning methods and –equipment. Stress, anxiety, frustration and injuries are all symptoms of poor welfare commonly seen in such situations and much of this has been subject to recent research. Better solutions are, slowly, put into practice.

Improving driving logistics using modern route optimization has under Swedish conditions been shown to reduce driving distance and thus CO2 emissions by 30-40% and reduce overnight lairage of animals from 40-60% to 0% (Håkansson et al., 2012). Other ongoing research shows a substantial potential to reduce the risks of injuries and stress during driving of animals (Atkinson, to be publ.) with the use of improved driving methods.

One of the main issues at slaughter is to use methods that immediately renders the animal unconscious with a duration that allows for enough time do bleed and thus kill the animal. Such ambitions may be divided into three phases; initiation of unconsciousness, risk of poor stun during bleeding and finally make sure that the animal is dead before any other activity to process the carcass starts.

Common practice to stun cattle is to use a captive bolt or a gun. In penetrating captive bolt guns, which are the most commonly used, a metal rod is propelled from the muzzle of the gun by the discharge of a blank cartridge inserted in a chamber behind the proximal end of the bolt. The impact of the bolts on the head of an animal causes concussion of the brain and rupture of brain blood vessels, leading to unconsciousness. When gun powder driven captive bolt stunning is applied, the quality of such stun has been shown to be questionable (Atkinson et al, 2013). Recent research indicates that the shot angle may play an important role and that the angle used (90 degrees) may be questionable to reach optimal conditions (Davidsson et al, 2014). The use of an air pressure driven stun gun, using considerable higher energy output has proven to increase stun quality substantially (Atkinson and Algers, 2009).

At large scale pig slaughter, using the Danish invention of driving of pigs in groups substantially improving pig welfare, gas has become a common stun method. Usually, high concentrations of CO2 are used to stun the pigs. Recent research show, however, that the initiation phase may be longer than previously known (Rodriguez et al, 2008) causing pain and anxiety in the pigs why new gas mixtures are studied to avoid this problem. Using low CO2 concentrations and nitrogen as a mixture seem to somewhat improve the welfare and recently the first full scale trial using such mixtures was conducted in Skara, Sweden. Results from this trial will be presented at the conference (Atkinson et al, to be publ.).

When is an animal dead to allow for further processing at the abattoir? There are legally no definitions of death that would tell us when to proceed with the slaughter process once the animal is being stunned. However, cessation of heart beat may be a good sign of death why an investigation was made to try to asses for how long heart beats could be recorded from the start of exsanguination of pigs and cattle at slaughter (Jerlström, 2014). The time from start of exsanguination to cardiac arrest was on average 5 minutes and 45 seconds for cattle and 2 minutes and 58 seconds for pigs.

Recent research increases our knowledge on better methods for the initiation of unconsciousness, how to reduce the risk of poor stun during bleeding and finally make sure that the

animal is dead before any other activity to process the carcass starts. Schemes for the assessment of animal welfare during stunning have been proposed by EFSA (2013). When it comes to the assessment of whether animals are suitable for transport to slaughter, better possibilities for veterinary inspection is needed. A project on the use of new technology for such situations is now underway. Together with meat inspection data such as injuries and pH, animal welfare at transport and slaughter can be properly assessed.

To eliminate some of the risks to poor animal welfare at slaughter mentioned initially, mobile slaughter may prove to be a better solution. The first European mobile abattoir for large cattle is now established in Sweden and future research will show the potential of such technology to improve both animal welfare and meat quality.

Animal welfare at slaughter: In practice

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Food safety, animal welfare and product integrity need to be assured when producing food of animal origin. Not only the consumer demands these guarantees, also the society provides the framework that allows animal production. Next to governmental ruling of animal welfare the market has also additional demands with regard to animal welfare.

Animal welfare is the responsibility of the food business operator (FBO) in the whole supply chain: from farmer until retailer / food service. Several FBOs have already defined animal welfare rules, e.g. Unilever, Tesco and Ahold. These rules are either FBO specific, or developed within an existing standard such as Global GAP. These standards include both criteria and control mechanisms to guarantee that rules are lived.

<u>How is animal welfare organised within Vion.</u>

1. Slaughter animals are only accepted when originating out of a recognised pre-harvest quality scheme, such as QS, IKB and GlobalGAP. This rule is already for 100% compliant in the Dutch pork slaughterhouses and >90% in the other pork slaughterhouses.
2. Of the pigs slaughtered in The Netherlands >75% are grown under welfare rules that are on top of legislation, according to private standards.
3. Each slaughterhouse has several animal welfare officers, individuals that are trained and certified to control animal welfare in a proper way.
4. All animal welfare aspects are directly controlled by own Vion slaughterhouse staff.
5. Check arriving animals for being fit for slaughter, when not the necessary decision is taken to separate the animal or to kill the animal in a proper way.
6. Control of animal welfare in the lairage.
7. Control of stunning and killing procedures.
8. All control procedures are based on private procedures, including monitoring, verification and documentation that needs to be carried out by qualified slaughterhouse staff.
9. Next to fulfilling the own responsibility within each individual slaughterhouse, the premises are internally audited on animal welfare, by staff of other premises.
10. Private standards and several critical customers audit the private standard that is agreed upon.
11. On top of all of this the official veterinarian supervises the whole process, during am inspection and during targeted audits.

So far the basis that is operational in all slaughterhouses. Vion measures and reports continuously compliance and performance levels of its processes, including animal welfare in order to show that animal welfare is under control. All these data are at any time available to all auditors that supervise Vion.

<u>Next stage projects.</u>

Together with the authorities Vion is developing Key Performance Indicators to show the level of compliance of animals delivered at the slaughterhouse. These indicators include e.g. loading density on trucks, promillage of animals not fit for transport, promillage of animals with emergency slaughter and so on. Within this project the slaughterhouse is responsible to control all these criteria at a proper

level. The official veterinarian supervises if the agreed compliances are realised, and when not a proper corrective / preventive measure is taken by the slaughterhouse staff.

Together with retailers a higher level of animal welfare for mainstream pork is organised. The criteria that are formulated as add-on modules within Global GAP (so global accessible for each farmer) include e.g. entire boars, more living space for the pigs, control of tail docking. Besides the realisation of a higher level of animal welfare, the costs of the programme in the whole supply chain are paid by the consumer.

Analysis methods are being implemented post slaughter to measure the level of water holding capacity of pork. Besides that this indicator is relevant for meat quality, it reflects also the stress level of individual animals during approximately the last days of life.

Conclusions

The market is demanding for control of animal welfare. This needs a basic reformulation of how to organise the next steps in improving animal welfare. Further development of private standards also with respect to animal welfare is the only sustainable way forward. The authorities have to focus on their supervision tasks and enforcement. FBOs are responsible for system development and control. A clear division of responsibilities, tasks and competences is what we are at least indebted to our animals.

6. Poster abstracts

Meat inspection and food safety at slaughter

P1: Green offal inspection: risk assessment of current and alternative inspection tasks

Bojan Blagojevic, N. Dadios, K. Reinmann, J. Guitian, K.D.C. Stärk*

In the EU, significant actions have been initiated in order to review and modernise meat inspection moving towards a more risk-based approach. The UK Food Standards Agency is also funding research to build the evidence base for the modernization of meat inspection. Green offal inspection is one of the control activities set out in Regulation EC 854/2004 on the organization of official controls on food from animal origin intended for human consumption. The extent to which this meat inspection task contributes to the reduction in public and animal health and welfare risk is under discussion. The study was conducted to assess the risks of changes to the current inspection of green offal to public and animal health as well as welfare in cattle, small ruminants and pigs. The assessment was conducted only for hazards that are prioritised under UK conditions. Available literature was used, and where no literature was available, experts were consulted to inform the assessment. With respect to public and animal health, the conditional likelihood of detection with the current green offal inspection was found to be *low* for eleven out of the twenty-four selected hazard-species pairings and *very low* for the remaining thirteen pairings. This strongly suggests that the contribution of current green offal inspection to risk mitigation is very limited for public and animal health hazards. A difference between current and downscaled, visual-only, inspection scenarios was observed only in three hazard-species pairings all of which are hazards only relevant to animal health. The removal of green offal inspection would reduce the detection of some selected animal welfare conditions. For all selected public and animal health as well as welfare hazards, the reduced detection could be compensated with other pre-harvest, harvest and/or post-harvest control measures including existing meat inspection tasks.

P2: *Mycobacterium avium* subsp. *hominissuis* in Portuguese slaughter swine *(Poster tour)*

*A. Gonçalves, B. Enguião, C. Ferro, I. Amorim, A. Canadas, A. Santos Silva; J. M. Correia da Costa, Eduarda Gomes-Neves**

Granulomatous lymphadenitis in swine is recurrently detected through meat inspection. The main agent is *Mycobacterium avium* subsp. *hominissuis* (*Mah*) a ubiquitous opportunistic pathogen that infects domestic animals, mainly pigs, and humans. In Portugal, there are scarce reports on the prevalence of *Mah,* so the aim of this work is the agent identification in lymphadenopathy detected in slaughtered swine. Submaxillary lymph nodes of 200 swine from 11 farms with granulomatous lesions were sampled. Samples were divided into two portions and processed for histological and culturing diagnostic methods. After homogenization and decontamination, the sediments were used for microscopic examination and culture. For isolation, the sediment was inoculated in Lowenstein-Jensen medium and in MGIT 960 liquid medium (Bactec MGIT 960 Mycobacterial Detection System, Becton Dickinson). Cultures were identified as *M. avium* spp. by an amplification and reverse hybridization method (GenoType Mycobacteruim CM, Hain Lifescience) and the identification at the subspecies level is ongoing using a multiplex PCR based on the sequences IS901, IS1245 and dnaJ. Macroscopic findings were compatible with mycobacterial infection in 99% (n=198) and microscopic examination demonstrated acid-fast bacilli (AFB) using Ziehl-Neelsen (ZN) staining in 45% (n=89) samples.

Microscopic direct examination and culture demonstrated, respectively, AFB in 59% (n=118) and mycobacteria growth in 72% (n=144) of the samples. Until the moment, PCR was performed in 87 isolates and all were identified as *Mah*. Since the evaluation of all data is not yet completed, no further analysis can be done. In spite of Council Regulation (EU) No 219/2014, which establishes visual inspection for routine slaughter swine, the post mortem incision of lymph nodes seems to be crucial for the detection of mycobacterial infection. However, it is necessary to identify the etiological agent.

P3: Consequences on the occurrence of mycobacteria of the *Mycobacterium avium-intracellulare* complex in slaughtered fattening pigs

Luppo Ellerbroek, J. Reetz, D. Meermeier, D. Hillemann, S. Klees, J. Kolb, E. Richter, S. Rüsch-Gerdes, B. Stührenberg*

Bacteria of the *Mycobacterium avium intracellulare* complex (MAIC) are ubiquitously distributed in the environment and can cause diseases in humans and animals, including pigs. Potentially, raw meat of slaughtered fattening pigs, which contains mycobacteria, might be a source for infections of humans with these pathogenic agents. The aim of this study was to determine the presence of mycobacteria in mandibular and mesenteric lymph nodes from 72 fattening pigs in Germany, which presented mandibular lymph node alterations, suspicious for mycobacterial infections by bacteriological and light-microscopical methods, i.e. isolation, species and subspecies identification, immuno-histochemistry, and the Kinyoun staining. In total, 83 % of pigs with macroscopic alterations on the Lnn. mandibulares identified during regular meat inspection of fattening pigs showed granulomatous lesions inside the Lnn. mandibulares found by bacteriological means and/or by light-microscopy. Isolates of the granulomatous altered mandibular lymph nodes were identified as *M. avium spp. hominissuis*. Mycobacteria were also identified by immunohistochemical investigation in unchanged mesenteric lymph nodes, particularly in the immediate proximity of/or within endothelial cells of lymph and blood capillaries. This localisation of mycobacteria suggests that some of the pigs investigated were in a septicemic phase of mycobacterial infection at the time of slaughter. Although further studies are required, it can be already concluded that: 1) if signs of granulomatous lymphadenitis are visible those pigs may be in a septicemic phase of a mycobacterial infection at the time of slaughter, 2) as an appropriate precautionary measure all mandibular lymph nodes of fattening pigs suspected for mycobacteria should be generally condemned and excluded from the food chain as they have a high potential risk for carrying Mycobacteria and other pathogens like Yersinia, and 3) in case of lesions at mandibular lymph nodes suspicious for Mycobacteria the liver and intestine of the corresponding carcase should be inspected with more attention.

P4: Effect of lairage on *Enterobacteriaceae* level on skin and carcass of slaughtered swine *(Poster tour)*

*R.D. Costa, V. Silva, Madalena Vieira-Pinto**

According to Regulation (CE) N.º 2073/2005, determination of *Enterobacteriaceae* in swine carcasses is mandatory and is considered a process hygiene criterion. The contamination of carcasses by *Enterobacteriaceae,* by means of direct or cross-contamination processes, mainly from bacteria present in intestinal or skin faecal material, can occur at different stages of the slaughter practice. The main aims of this research were to analyse the relationship that could be established between pigs holding time in lairage and their skin *Enterobacteriaceae* level before slaughter and on the respective

carcass. To reach these objectives, sponge swabs were performed on the skin of 51 swine (approximate area 1000 cm^2) after stunning with known holding time in lairage. Excisions in the respective carcasses were made according to ISO 17604 and Regulation (CE) Nº 2073/2005. In the laboratory, samples were analyzed according to method defined on ISO 21528-2:2004. The achieved results showed that increasing time in lairage holding leads to an increasing level of *Enterobacteriaceae* both in swine skin (R=0.496; p-value <0.001) and in the respective carcass (R = 0.463; p-value <0.001), with these relationships being highly significant. According to European Regulation CE) N.º 2073/2005, when the results of testing against this criteria (*Enterobacteriaceae*) are unsatisfactory, improvements in slaughter hygiene and review of process controls must be implemented. Our results indicate that these improvements should advantageously include corrective actions to increase hygiene level at the skin swine level. Acknowledgments: The work was supported by the strategic research Project PEst-OE/AGR/UI0772/2011 financed by the Foundation for Science and Technology (FCT).

P5: Could skin level cleanness be an indicator of *Salmonella* in slaughtered pigs? *(Poster tour)*

*V. Silva, R.D. Costa, Madalena Vieira-Pinto**

Salmonella spp. can be present in slaughtered pigs at the gastrointestinal tract, associated lymph nodes and skin, being in this last case, frequently assumed that its presence should be lower in animals with less visible faecal contamination. The purpose of this study was to confirm if the visible level of faecal contamination (VLFC) observed in pigs at slaughter can be used as an indicator of *Salmonella* spp. To reach that purpose a classification scale (between 0 - 4) was created in order to quantify VLFC. This procedure was implemented after the bleeding process and consisted of a sponge swab (1,000 cm^2 area) in the dorsal surface of pigs' skin. At the laboratory, the sponge samples were microbiologically analysed based on ISO 6579:2002. A total of 120 samples were analysed. *Salmonella* spp. was isolated from 29.2 % of the pigs' skin, underlining its importance as a source of slaughterhouse contamination. An average level of 0.45 for VLFC was determined revealing, in general, relatively clean samples, which could be due to an effective shower with high-pressure water that pigs went through just before stunning. The statistical results did not support any significant difference in *Salmonella* spp. isolation among pigs with different levels of cleanness (t=1.236; *p*-value=0.19). Also, it was observed that in 12 pigs that *Salmonella* was isolated from swine skin without VLFC. These results suggest that VLFC in pigs skin at slaughter should not be used as an indicator of *Salmonella* spp. once a previous shower seems to be effective in the reduction of dirtiness but, apparently, not effective in *Salmonella* sp. removal that could still be adhered to the skin. More studies should be derived in order to better understand this subject. Acknowledgments: The work was supported by the strategic research Project PEst-OE/AGR/UI0772/2014 financed by the Foundation for Science and Technology (FCT).

P6: Lactic acid treatment of bovine carcasses after slaughter *(Poster tour)*

*Kaufmann, Lautenschläger, Weber, Marco Ebert**

Food business operators are not allowed to use any substance other than potable water to remove surface contamination from products of animal origin, unless use of the substance has been approved. For the first time such approval was done by the Council Regulation (EU) No 101/2013 in February 2013. This Regulation permits the use of lactic acid to reduce microbiological surface contamination

on bovine carcasses or half carcasses or quarters at slaughterhouse level in compliance with the flexible conditions set out in the Annex to this Regulation. Therefore the Department of Safety and Quality of Meat of the Max Rubner-Institute in Kulmbach and the University of Applied Sciences Neubrandenburg conducted studies to lactic acid treatment of beef as part of a master's thesis. Twelve flanks of cattle were sprayed or once nebulized with two different lactic acid solutions of the concentrations of 2%, 3.5% and 5%. On the one hand, solutions contained, commercially available L-lactic acid, and on the other hand, a micellar form of lactic acid was applied. After treatment with the acid solutions the meat was stored at 10 °C and examined microbiologically (mesophilic total aerobic plate count, Pseudomonades, Enterobacteriaceae and enterococci), physically (colour and pH) and chemically (lactic acid content in meat and fat ratios) at defined intervals. Furthermore, a sensory evaluation was carried out by a profile analysis of roasted beef after two weeks of dry-aging. Since the evaluation of the collected data is not yet completed, no detailed analysis can be done here. The results indicate that the native lactic acid-treatment in all concentration levels was found to be significantly more effective in terms of germ reduction than treatment with micellar lactic acid. In assessing the divergence of the types of application, the spray treatment seems more promising in comparison to nebulization.

P7: Surveillance of the Ail and FoxA genes in *Yersinia enterocolitica* strains isolated from pork meat samples

Stefanos Petsios, S. Marika, P. Zoi, V. Angeliki-Maria, G. Panagiota, P. Chrissanthy*

Yersinia enterocolitica causes a self–limiting gastroenteritis and recently is considered the fourth most frequently reported foodborne zoonosis. Pigs are an important reservoir of the pathogen and contaminated pork meat can be the source of human infection. According to the existing literature the ail and foxA genes have a major role in the pathogenicity mechanism of the microorganism. The present survey aimed to study the prevalence of the ail and foxA genes of *Y. enterocolitica* isolates from pork meat. During a ten month period (August 2013-May 2014), meat samples from 116 pigs from different farms were collected at slaughter and 43 strains of *Y. enterocolitica* were isolated, biochemically identified, biotyped and serotyped. For the detection of the ail and fox genes, DNA was prepared from pure cultures using the QIAmp DNA Mini Kit (QIAgen, Cat No. 51304). The following pairs of primer-set were used: i) for the ail gene F'-GGTTATTGTATTAGTATTGTT, R'-CAGGTGGGTTTTCACTATCTG and ii) for the foxA gene F'-CTCTGCGGAAGATAACTATG, R'-ATCCGGGAATAAACTTGGCGTA. Two single PCR reactions were performed and products were fractioned in 1.5% agarose gel. **All the pathogenic strains (29 strains of biotype/serotype 4/O:3 and 3 of 3/O:3) harbored both the ail and foxA genes. From the non-pathogenic strains (4 strains of 1A/non O:3, O:9 and 7 of biotype 1:lipase -, esculin +/serotype non O:3, O:9) none carried the ail gene but 72.73% carried the foxA gene. Further studies on the** polymorphism of foxA gene sequence among diverse strains are needed to explain the pathogenicity mechanism.

Food hygiene, control and outbreak investigation

P8: Assessing the effectiveness of official controls by studying infringement frequency in food businesses *(Poster tour)*

*Christian Berking**

According to article 8 in regulation (EC) No 882/2004, the national competent authorities shall verify the effectiveness of their official controls. To this end the detection of infringements in food businesses during official control inspections can be evaluated. Are the controls applied in the same way and are inspections done in a fair and equitable manner to different types of food businesses and all over Sweden? During 2 years from April 2012 to April 2014, infringements were registered in a database at the National Food Agency (NFA). Geographical differences in infringement frequencies were observed when comparing 17 local control teams, for the periods, April – Dec 2012, 2013 and Jan – April 2014. Control teams noting high and low frequencies outside the 95% confidence interval (CI) of the average infringement frequency were identified. The next step is to identify the reasons behind this and supervisors at the NFA can further investigate the teams with outlying results. The focus is to assess whether the teams are working in accordance with instructions for official control. In the same way and for the same reasons, the infringement frequencies were studied for 14 inspection areas (e.g. HACCP, pest control and microbiological criteria) and 95% CI were calculated for the average frequency in each area. Inspection areas with high and low infringement frequencies were identified. The supervisors can here use a similar approach to assess the effectiveness in official control. The infringement frequency was also studied for 30 different types of food businesses (e.g. slaughterhouses, game handling establishments and establishments for fish products) and average infringement frequencies with 95% CI were calculated. Due to a low number of inspections for some food businesses the 95% CI were calculated for the period April 2012 – April 2014. Food business operators with high and low frequencies of infringement were identified.

P9: Foodborne outbreak investigation – Challenge for food science and public health sector – A case study *Salmonella* Derby-outbreak in high-risk food for young, old, pregnant, and immunosuppressed people

*Karsten Giffey**

Foodborne Outbreak Investigation is a special task of veterinary epidemiology in the public health sector. The surveillance of hygiene and safety of food of animal origin is essentially held in the hand of veterinarians. The poster gives an overview about a foodborne outbreak that occurred at end of 2013 and in the beginning of 2014. Various hospitals in Berlin notified clusters of diarrheal diseases, caused by a *Salmonella* Group B-serotype. Affected were elderly as typical representatives of the so-called YOPI (Young, Old, Pregnant, and Immunosuppressed) consumer group. As a hypothesis, a risk food had been identified as infection vehicle. The food came from a variety of hospitals serving a large kitchen, where a veterinarian took reference samples to make sure investigation. Raw sausage was delivered by a company; *Salmonella*-positives batches of meat were recalled. Two employees of the company were found to be shedders of *Salmonella* Derby (the outbreak strain). The entire production was not yet consumed, voluntarily recalled and the outbreak was stopped. The search for the source of infection, recall and preventive measures in the outbreak investigation are presented. Steps of the outbreak, results and experience of the investigation are given. Discussion and an outlook on changes

are given. The poster presents the advantages and disadvantages, positive and negative aspects of cooperation between stakeholders are described and suggestions for improvements are provided. In summary, the poster gives an overview about the cooperation work of the Public Health Sector together with Food Science Experts.

P10: EU approval of sprout-producing companies – New requirements on the hygiene in the sprout production

*Karsten Giffey**

In the early summer of 2011 contaminated sprouts were, with very high probability, the triggers for the biggest enterohemorrhagic *E. coli* (EHEC) outbreak in Germany. In total, nearly 4,000 reported human cases of illness were associated with the outbreak. People were infected with the seeds through direct animal contact or raw foods. In order to improve the food safety of sprouts, and to resolve sprout-associated outbreaks faster in the future, the EU has developed four new regulations in July 2013. These regulations include stringent hygiene requirements and an authorization requirement for sprout farms, an EU-wide control system to improve the traceability of the flow of goods and delivery routes, more stringent import requirements for products from third countries and an extension of the regulations on microbiological criteria for foodstuffs to a new food safety criterion for sprouts. The new EU regulations provide, inter alia, authorization before sprouting of manufacturing companies. These companies will continue to be classified as primary production and have to fulfil the prescribed requirements for the approval and the requirements of Annex I of the EU regulation on food hygiene. In the State of Berlin, there are currently three operations undergoing the approval process. Pictures illustrate the experience of the requirements on the spot. The poster presents the challenges for the Food Business Operator and the Inspection Service, and gives a guide to bring forward and make suggestions for improvements. In summary, the poster gives an overview about the requirements to guarantee a high level of quality and food hygiene professional production in this specific risky food.

P11: When vet students do research your lunch will never taste the same

Michael P. Reichel, M.R. Ewens, S. Cox*

Pathogens such as *Salmonella spp., Campylobacter spp., Listeria monocytogenes* and *Escherichia coli* are responsible for up to 5.4 million cases of foodborne infection in Australia each year. “Ready-to-eat” deli meats are highly susceptible to cross-contamination with these pathogens and, additionally, favour pathogen growth. The present study was designed by DVM students as part of their final year Veterinary Public Health rotation and was aimed at quantifying the microbial flora of 174 samples of various, “ready-to-eat” deli meats, purchased from supermarket delicatessens in the greater-Adelaide area. A combination of Oxoid culture media and 3M® Petrifilm were used to grow the potential pathogens. Individual microorganism levels were then compared with levels specified in the FSANZ (Food Standards Australia New Zealand) Guidelines for the microbiological examination of “ready-to-eat foods”. No recognised pathogens were confirmed from the 174 samples of ready-to-eat, deli-sliced meats tested in this study. However, the total bacterial counts for 134 (77%) of the samples exceeded the level for “satisfactory” classification, as defined by the FSANZ guidelines. The results of this study concluded that hygienic food handling and HACCP protocols were not being practiced at some greater-Adelaide area supermarket delicatessens. The project provided a practical application of the students

technical, microbiological and clinical research skills and an opportunity to deepen their appreciation of their VPH responsibilities.

P12: Development of innovative process integrated microbiological stage control systems for the reduction of *Campylobacter* spp. and *Salmonella* spp. in meat production ("InnoStep")

Rohtraud Pichner, M. Rossow, S. Maurischat, B. Malorny, G. Gölz, T. Alter, M. Voetz, S. Mergemeier*

The commercial success of meat and meat products in national and international markets depends on the production of healthy foods under proper hygiene conditions. Therefore the Federal Ministry of Food, Agriculture and Consumer Protection (BMELV) initiated a program to promote innovations for the enhancement of meat quality. One task of this program addressed the reduction of *Salmonella* and *Campylobacter* within the slaughter line of poultry. Optimized quantitative and standardized rapid identification procedures for integration into production, storage, processing, distribution and preparation of meat are of paramount importance for the stakeholders (from primary production up to control authorities). These monitoring and measuring procedures are prerequisites for immediate targeted actions and, combined with the development of novel technological applications, they facilitate a sustainable reduction of *Salmonella* and *Campylobacter* contamination. Hence, this project focusses on the development of all features, which are indispensable for an effective microbiological stage control of *Salmonella* and *Campylobacter* contamination during the processing of fresh chicken meat. Therefore this approach aims to optimize existing methods and to design innovative detection techniques where appropriate in order to create modules for the stage control system. In this way, the producers of meat products will be enabled to identify possible sources of cross-/recontamination and to initiate effective measures up to technological modifications of manufacture. Funding: The project is supported by funds of the Federal Ministry of Food, Agriculture and Consumer Protection (BMELV) based on a decision of the Parliament of the Federal Republic of Germany via the Federal Office for Agriculture and Food (BLE) under the innovation support programme.

P13: Growth of *Listeria monocytogenes* in a traditional Austrian meat jelly product

*N. Awaiwanont, F.J.M. Smulders, Peter Paulsen**

European Union establishes limits for *Listeria monocytogenes* in ready-to-eat foods depending on if the product favours the growth of this pathogen. This is related to pH, water activity (a_w) and shelf-life. Among the traditional Austrian liver patés, meat spreads, blood sausages and meat jellies, only the latter group has the potential to retard multiplication of *Listeria*, due to the low pH of gelatin/aspic used as a binder. Other components (cooked cured meat chunks and preboiled vegetable) differ in pH and a_w and, thus, can create a niche for the multiplication of *Listeria*. Hence, we studied the survival/growth of *Listeria monocytogenes* inoculated onto the separate main components as well as on the composed product. Expectedly, a_w remained stable in the vacuum packed compounds over a 21 days period, with 0.972; 0.982; 0.965; 0.980 for the composed product, meat, jelly and vegetables, respectively. Corresponding pH values were initially 5.6; 6; 4,8 and 6.7 and remained stable in jelly over 21 days (2 and 8°C), but dropped in the other compounds. *Listeria monocytogenes* counts remained stable in jelly over 21 days (2 and 8°C), whereas in meat and vegetables, a >1 log unit increase was observed after 7 days at 2°C (or >5 log at 8°C). In the composed product, *Listeria* numbers remained stable at 2°C (21 days), but rose >1 log during 7 days at 8°C. This confirms the need to maintain storage temperatures near to 0°C for vacuum-packed meat jelly.

P14: Analysis of the beef chain in Pakistan and evaluation of food safety implications of the introduction of shelf-stable beef products

*K. Nauman, F.J.M. Smulders, Peter Paulsen**

The meat producing cattle livestock in Pakistan amounts to nearly 40 million heads. Most cattle are dual-purpose breeds and reared extensively in small farms. A comparable small number of cattle is slaughtered and subjected to meat inspection in large abattoirs equipped with appropriate cooling facilities. Most animals are slaughtered by butchers in governmental slaughter facilities or in their own premises and the meat is supplied to the consumer at the day of slaughter in warm condition, with no special distinction between the different meat cuts. This current marketing system offers little potential for value-added products, but changes in cattle breeding and beef production aiming at optimizing meat yield as well as changing meat preferences of urban populations may create a niche for processed beef. In our study, we ranked the food-borne biological hazards associated with beef in Pakistan (based on original data or on comparative evidence) and explored how these hazards could be controlled in heat-processed or fermented meats in the framework of HACCP. Meat products were based on European style products, but with vegetable fat replacing pork fat. In pertaining studies, the consumer acceptance of such products will be explored.

P15: Diversity of EHEC strains, source of infections and outbreaks of EHEC in Germany – Review of the Literature

Tatjana Miller, M. Buelte*

Enterohemorrhagic *E. coli* (EHEC) causes gastroenteritis and *hemorrhagic* colitis in adults, but approximately 5-10 % of people with gastroenteritis due to EHEC develop hemolytic-uremic syndrome (HUS). The reservoir for EHEC infections in humans are primarily seen in animals and especially cattle that are asymptomatic carriers. The objective of this study was to evaluate the current epidemiological data of EHEC sporadic infections and EHEC outbreaks in Germany. The study was carried out by analysis the annual reports of the Robert Koch Institute from 2008 to 2013. In the period from 2008 to 2013, the number of reported EHEC-cases was between 900 and 1.600. Of these, 40-80 (5-7 %) of ill persons developed HUS. Subsequently, 20 to 60 outbreaks of EHEC with 2-10 cases each were annually registered in Germany at the National Reference Centre for *Salmonella* and other Enteric Pathogens (NRC). Particularly, the EHEC-strains with O-antigens O26, O111, O103, O145, O157 and O91 are epidemiologically predominant. EHEC-strain O104:H4 was the only found in the *largest outbreaks* in the year 2011 and it has been isolated only sporadically in outbreaks worldwide. Some outbreaks have been associated with traveling to Turkey, Morocco and Italy in the years 2010 and 2011. In family infections human-to-human transmission (especially by SF O157:H^- strains) could be observed, but it is epidemiologically difficult to distinguish human-to-human transmission from infections via contaminated food. In contrast, in community facilities the outbreaks were caused by contaminated food. For example in nurseries in the years 2008 and 2011 the serovars O103:H2 / O55:H7 and O91:H^- have been identified. Remarkably, in most of the suspected food-caused outbreaks the source could not be identified because the food was no more available. In the last five years food as primary source of EHEC-infections could be identified only twice (sprout und milk).

Vector borne, tropical and emerging diseases

P16: The European Network for Neglected Vectors & Vector-Borne Infections (EurNegVec- COST action TD1303): an example of interdisciplinary collaboration in Public Health *(Poster tour)*

Daniele De Meneghi, D. Modry, B. Alten, A. Mihalca*

The European Network for Neglected Vectors & Vector-Borne Infections (EurNegVec; http://www.eurnegvec.org/action.html) is an EU COST action (TD1303) which includes 33 participating countries with representatives from 55 Institutions. Participants –researchers from different disciplines: veterinarians, medical doctors, biologists, entomologists, ecologists- are assigned as experts in five Working Groups (WGs), namely WG1: the "One Health" concept in the ecology of vector-borne diseases; WG2: barcoding, molecular diagnosis and next generation sequencing; WG3: geospatial tools in vector research; WG4: phylogenetics and phylogeography of vectors and vector-borne pathogens; WG5: rare and emerging vector-borne pathogens. EurNegVec-TD1303 organizes three type of activities: (i) annual conferences (in connection with WG and Management Committee meetings); (ii) short term Scientific Missions; (iii) Training Schools. Additionally, various materials on vectors and vector-borne diseases and related Public health topics are published. The main objectives of EurNegVecTD1303 are to establish a powerful trans-boundary network across Europe of partner institutions involved in education and research on arthropod-transmitted infectious diseases of man and animals, and to address the growing importance of vector-borne diseases at a time of global change. WGs activities are all integrated under the One Health concept (especially WG1) and reflect the complexity and demands of current high-end research. The research tasks to be addressed are implemented using two approaches: (i) vertical activities, focused on the activities of the WGs 1-4; the vertical research tasks are centered on each WG, through the implementation of concepts and methodologies in research, diagnosis and surveillance of vectors/pathogens/diseases; (2) horizontal events, involving trans-WGs activities and the activity of WG5. Participants have compiled a list of neglected topics related to vectors and zoonotic vector-borne pathogens considered relevant for Europe -flexible and certainly not exhaustive- which includes: Ticks and tick-borne pathogens; Dipterans and dipteran-borne; Fleas and flea-borne pathogens; these topics will be considered by the WGs 1-4 in their vertical tasks.

P17: *Rickettsia aeschlimannii* and *Rickettsia africae* in ticks collected from livestock in Burkina Faso and Ethiopia

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Tick-borne rickettsiae are emerging pathogens belonging to the Spotted Fever Group (SFG). Among them, *Rickettsia africae* is the most widespread SFG rickettsia in sub-Saharan Africa, where it causes African tick-bite fever; *Rickettsia aeschlimannii* is characterized by a more heterogeneous geographical distribution and causes symptoms similar to Meditteranean Spotted Fever, symptoms which have been reported so far in African patients or in patients travelling from Africa. In the framework of two research-development projects, in Ethiopia and in Burkina Faso –cofinanced by Regione Piemonte, programme for Decentralised Development Cooperation, and by UNITO_MIUR, local research funds (*ex-60%*)- we developed a quantitative PCR assay to detect *R.aeschlimannii* and *R.africae* OmpA gene. According to our preliminary data, *R.aeschlimannii* was found to infect *Hyalomma rufipes*, *H.truncatum*

and *H.impeltatum* ticks, randomly collected from nomadic herds (cattle, small ruminants and camels) in villages located in Filtu and Dollo districts, Libaan zone, Somali region of Ethiopia; the overall prevalence was 80% (95% confidence intervals, IC: 56.3-94.3). In Burkina Faso, *H.truncatum* and *H.rufipes* were collected from cattle in different provinces throughout the Country, and 36.2% were infected by *R.aeschlimannii* (95% CI: 22.7-51.5). A very high *R.africae* prevalence (81.2%; 95%CI: 63.6-92.82) was registered in *Amblyomma variegatum* ticks from the same animals. This is the first detection of the two pathogens in Burkina Faso and in the Somali Region of Ethiopia. As recorded in other African countries, *R.aeschlimannii* and *R.africae* show a high prevalence in *Hyalomma* and *Amblyomma* spp. ticks, which are their main vectors and reservoirs. Although the zoonotic potential of these pathogens is known and clinical cases are described quite often in travellers from Africa, further studies are needed to assess the extent of the zoonotic risk and prevalence of infection in livestock keepers, local villagers and population, who have high contact rates with ticks and their vertebrate hosts.

P18: Prevalence of selected diseases - including zoonoses - in goat herds from Sao Antao island, Cabo Verde

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Goat breeding for traditional cheese production (raw milk) is part of the local husbandry system in the Planalto Norte, Sao Antao island, Cabo Verde. Scanty studies (mainly unpublished reports) on the health status of the local goat population are available. The analysis of the annual OIE Disease reports (2007-2013) for the whole Cape Verde islands did not reveal cases of the diseases included in our study, except for suspected –never confirmed- cases of paratuberculosis and tuberculosis (reportedly in cattle from Santiago island). Within the framework of a research-development project, aimed to support the "*Cooperativa Criadores das Montanhas, Santo Antao*", co-financed by Development Cooperation programmes, Regione Piemonte/Ministry of Foreign Affairs, and by local research funds UNITO_MIUR, blood samples (n=274) were preliminarily collected from 5 sentinel goat herds, out of 14 herds. Sera were tested for antibodies against agents of selected goat diseases, including zoonoses: i. brucellosis, by Rose Bengal Test, prevalence (p)=0%; ii. Q-fever, ELISA Chekit QFever®IDEEX, p=18-46,7%(min-max); iii. contagious agalactia, Pourquier®Elisa *Mycoplasma agalactiae* Serum Screening, p=1.4.%; iv. caprine arthritis-encephalitis, in-house ELISA (P16-P25 recombinant antigens), p=1,4%; v. border disease, BVD p80 ELISA kit Pourquier, p=0%; vi. paratuberculosis, Pourquier®Elisa Paratuberculosis Antibody Screening, p=0%. Blood sampled goats were also submitted to tuberculin skin test (Caudal Fold Test using PPD); no reactors (p=0%) were detected. Our results –although preliminary- are quite reassuring from both animal and public health points of view, except for the high Q-fever seroprevalence. The adverse impact of Q-fever in goat breeding as well as its implications for public health, are well known. Considering the high positivity (81.6% of human sera) reported from past studies (1988) carried out in Cabo Verde islands, it is definitely worth assessing the extent of the zoonotic risk for local herders and population, due to contacts with potentially infected animals and their products (milk, cheese).

Epidemiology and zoonoses

P19: Prevalence of IgG against hepatitis E virus, *Salmonella* spp., and *Toxoplasma gondii* in meat juice samples from wild boars hunted in Southern Italy *(Poster tour)*

Eleonora Sarno*, N. Costanzo, V. Quaranta, A.M.L. Santoro, R. Stephan

Wild boars can be an important reservoir for zoonotic foodborne pathogens and a matter of concern in view of public health. The objective of this study was to investigate the prevalence of immunoglobulin G (IgG) against hepatitis E virus (HEV), *Salmonella* spp., and *Toxoplasma gondii* from hunted wild boars using commercial ELISAs for meat juice investigation. A total of 200 diaphragm muscle samples (ca. 10 g per sample) collected from shot boars originating from three neighbouring regions in Southern Italy were examined. The overall seroprevalence in the collection was 57.5 % for HEV (*Priocheck® HEV Ab porcine*), 65.0 and 7.0% for *Salmonella* spp. (*Salmotype® pig screen* and *Priocheck® Salmonella Ab porcine*, respectively), and 14.0% for *T. gondii* (*Priocheck® Toxoplasma Ab porcine*). These results underline the impact of wild boars as an important reservoir for zoonotic agents. Contact of wild boars with fattening pigs may pose a risk of transmission and spreading of these pathogens.

P20: *Salmonella*: Effect of chilling pork on the sensitivity of the sampling method *(Poster tour)*

Gerty Vanantwerpen*, L. De Zutter, K. Houf

Salmonellosis is the second most important bacterial zoonosis in Europe. The consumption of pork is an important source for human infection. Sampling pork in the slaughterhouse is a useful control point to evaluate the entrance of *Salmonella* in the food chain. The moment of sampling and the method used for sampling may both have an influence on the recovery of *Salmonella* after chilling in the slaughterhouse. If the difference in recovery of bacteria between sampling before and after chilling is due to the sampling method, this method should be changed according to the moment of sampling. In two slaughterhouses using different cooling methods of carcasses, four strains were used in two different dilutions and transferred to pork skin. The skin pieces were sampled before and after chilling with two different sampling methods: swabbing (100 cm^2 of skin was swabbed) and destruction (100 cm^2 of skin was cut out). Both slaughterhouses were visited three times and each sample was made in triplicate. All samples were analysed using the ISO-method. There was no difference observed between the cooling methods. The most sensitive method before chilling was swabbing, whereas after chilling the destruction method yielded the highest number of positive samples. There was no significant difference between swabbing before chilling and destruction after chilling. A real decrease in recovery of *Salmonella* before and after chilling was absent. The sampling method should be adapted to the moment of sampling to obtain the best possible sensitivity of the detection method.

P21: Epidemiology and control of enteropathogenic *Yersinia* in the pork production chain – a literature review *(Poster tour)*

Riikka Laukkanen-Ninios, M. Fredriksson-Ahomaa, H. Korkeala

Enteropathogenic *Yersinia,* i.e. *Yersinia enterocolitica* and *Yersinia pseudotuberculosis,* are zoonotic pathogens causing yersiniosis, a foodborne intestinal illness in humans. Yersiniosis has been the third most frequently reported zoonosis in the EU. *Y. enterocolitica* is common in pork production and pork

is associated with infections in humans. The sources of yersiniosis caused by *Y. pseudotuberculosis* are less clear. However, *Y. pseudotuberculosis* is detected in pigs and pork. We reviewed literature regarding enteropathogenic *Yersinia* to elucidate intervention points within the pork production chain. Worldwide, 2–93 % of studied pigs and 22–85 % of the studied pig farms have been positive for *Y. enterocolitica.* For *Y. pseudotuberculosis,* 0.1–78 % of pigs and 6–60 % of farms have been positive. Reducing this high occurrence of enteropathogenic *Yersinia* in pigs and farms would drastically reduce contamination pressure of carcasses and pluck sets at the slaughterhouses. Purchasing piglets from multiple farms increases the chance to receive enteropathogenic *Yersinia* on a fattening pig farm. Using all-in/all-out strategy and buying piglets from enteropathogenic *Yersinia*-negative breeding farms are presently the most effective interventions for fattening pig farms. Feasible on-farm intervention methods are lacking and research is needed to solve how enteropathogenic *Yersinia* can cost-effectively be eradicated from breeding farms. At slaughterhouses, the occurrence of enteropathogenic *Yersinia* can be reduced by slaughter hygiene, bagging of the rectum, removal of tonsils and tongue along with the head, and by some carcass decontamination methods. After slaughter, the ability of enteropathogenic *Yersinia* to multiply during cold storage and under modified atmospheres makes controlling enteropathogenic *Yersinia* difficult. In addition, current knowledge and actions in both domestic and professional kitchens are insufficient for the prevention of yersiniosis. The review showed a notable lack of information on enteropathogenic *Yersinia* in many aspects of pork production, emphasizing a need for further research.

P22: *Streptococcus suis* in pig holdings in Germany

Nina Langkabel*, A. Ludwig, R. Ludewig, L. Bräutigam, D. Meermeier, R.Fries

S. suis is a zoonotic agent reaching from pigs into human ecospheres. Disease in humans has been attributed to several genetic sequences. Persons like farmers, slaughterhouse personnel, veterinarians, even kitchen personal are exposed. Morbidity and mortality caused by *S. suis* have been noted worldwide, especially in Southeast-Asian countries. In this study, pig carcasses deemed fit for human consumption were examined for *S. suis*. The aim was to investigate the occurrence of the agent in German holdings including their pathogenicity factors. Thirty-eight pig carcasses fit for human consumption from 17 holdings were selected. From each carcass, 17 different locations were sampled and examined for *S. suis* with conventional microbiological techniques and with PCR. From 69 randomly selected streptococcus-isolates (1 to 3 isolates / pig) we examined *S. suis* pathogenicity factors *epf*, *mrp*, *sly*, and *arcA* with PCR. In total, 117 *S. suis* isolates were found; five serovar 2 and one serovar 1, all of them coming from different holdings. From the 69 isolates, 35 were microbiologically and PCR-positive, 34 were PCR-negative at species level. Isolates being PCR-positive were also positive for factor *arcA*. In addition, two were *mrp* positive, but *epf* and *sly* were not found. The two positive isolates for *mrp* + *arcA* came from two animals from two different holdings. The combination *mrp* + *arcA* was found in another examination for *S. suis* serovar 2. Non-*S. suis* (PCR-negative) strains did not show pathogen sequences, whereas *S. suis*-positive strains contained pathogenic sequences. All carcasses were deemed fit for human consumption. Hence, the transfer from pigs to humans via food of swine origin may serve as an open window for this agent.

P23: Colonic irrigation for cows: can chlorhexidine lavage reduce the shedding of VTEC O157 from cattle?

M.K. Henry, Sue C. Tongue, J. Evans, C. Webster, I.J. McKendrick, G.J. Gunn*

Verotoxigenic *Escherichia coli* (VTEC) O157 is a pathogen with an important role in public health in the UK due to the high cost incurred in severe cases in humans. As a commensal of the ruminant tract, the animal health focus has been on ways to reduce contamination entering the food chain e.g. clean livestock policies. As yet, there are few techniques available to cattle producers to reduce the levels of VTEC O157 shed in cattle faeces. The aim of the study was to see if a technique - chlorhexidine lavage of the terminal rectum, which worked under controlled conditions in experimentally infected calves, would be feasible in the field and reduce the levels of VTEC O157 being excreted in the faeces of cattle that were close to finishing. Seventeen commercial farms in Scotland were involved over the course of five winter housing periods. VTEC O157 counts in swabs taken from the rectal wall at the time of treatment and after 28-days were compared to assess the effect of treatment within the individual animal. Environmental VTEC O157 burden was assessed by sampling of faecal pats from areas where treated and untreated cattle were housed. Practically, the intervention method proved easy and safe to apply in the typical commercial farm situation. Statistically, chlorhexidine lavage was effective (i.e. statistically significant) at reducing the shedding of VTEC O157 in some instances. There was substantial variation in outcome between farms years, highlighting the complexity of the epidemiology of VTEC O157 in cattle. Although not sufficient as a sole method to mitigate the risk to humans from VTEC O157 in cattle, chlorhexidine lavage has the potential to be used as a risk-mitigation measure and may have a role to play in certain situations, such as in an 'outbreak' situation on farms open to the public.

P24: One Health in action: The first veterinarian employed at a Dutch Community Health Service (GGD) *(Poster tour)*

Tineke Kramer, L. Lipman, A. van Lier*

In this day and age, we face a world where it is estimated that 60% of human infectious disease consists of zoonoses. Increased global trade and travel, intensified land use, climate change and a growing human population make it possible for these diseases to spread quickly across the globe. These factors display the need for a multidisciplinary approach to infectious disease prevention and control and other challenges of the (near) future as e.g. antibiotic resistance. This approach is captured in the One Health concept, which recognizes that human health is intrinsically linked to animal and environmental health. This concept is recognized by both IRAS/VPH and GGD Utrecht region. Starting January 2014, for the first time in the Netherlands a veterinarian was employed at a GGD at the Infectious Disease Control department. The goal of this placement was to discover the possible added value of a veterinarian at a regional GGD. The Netherlands has 28 regional GGD's contributing to guarding, improving and protecting the health of the Dutch people. Practically it was decided upon to place the veterinarian for one day a week at the GGD, for a duration of six months. After this time, the possible added value of a veterinarian at the GGD would be evaluated by both involved parties (GGD and IRAS/VPH). Duties were developed in mutual agreement between IRAS/VPH and GGD Utrecht region. Tasks consisted of involvement in case discussions, consulting to municipalities, performing research and public health advice to petting zoos. After the six months' time frame, it was decided upon in mutual agreement to prolong the placement and to officially employ the veterinarian at the

GGD for one day a week. The added value was seen in bringing veterinary knowledge and being a possible connector between the environmental and infectious disease departments of a GGD.

P25: Impact evaluation and priority ranking of zoonoses in Mongolia

Petra Muellner, A. McFadden*

Mongolia, like many other countries, faces significant health issues associated with a high incidence of endemic zoonoses whose control has been limited by a lack of integrated control measures, accounting for both animal and human populations. A large proportion of Mongolia's population is dependent on livestock for food and income. Therefore poor livestock health not only poses a risk to human health but will adversely impact on livelihood, for example through impact on human nutrition, human food security and human poverty levels. Risk ranking is widely recognized as a starting point for risk-based priority setting and resource allocation and has been established as an important component of risk management frameworks. It is also considered an important first step towards strengthening national zoonoses surveillance capacity and hence improved zoonoses control. In the work described an assessment framework to rank zoonotic diseases in Mongolia and to identify high-priority diseases was developed. In a first step previous relevant activities in Mongolia were reviewed and a hazard list of zoonoses (n=22) relevant to the region and the objectives of the project was compiled. This was followed by a review of available methods for ranking and finally the development of a multi-criteria zoonosis ranking model for Mongolia, which assesses both the impact of each disease and the feasibility of its control. The model identified five high-priority diseases, namely ovine brucellosis, echinococcosis/hydatids, rabies, anthrax and bovine brucellosis. In a final step recommendations for joint surveillance, control and resource allocation were made.

P26: Interactive visualisation of animal health surveillance data - information for veterinary public health action

*U. Muellner, F. Vial, F. Wohlfender, D. Hadorn, M. Reist, Petra Muellner**

Early detection of disease outbreaks or changes in the frequency of infection in animal populations plays a vital role in reducing the impact of emerging and endemic zoonotic diseases. The goal of this project was to develop web applications for different types of Swiss animal health surveillance data to improve early detection of outbreaks through interactive and real-time display of the data. Google Maps and Charts are widely available, multi-device capable and very powerful software tools for visualization of data. They were applied to two different datasets from the Swiss Federal Food Safety and Veterinary Office: (i) post-mortem meat inspection data and (ii) data from a web-based surveillance system for equine diseases. Interactive reporting dashboards were created to allow for visual comparison of case numbers in space and time. Both dashboards were set up in a way that splits the visualization from the data source. Underlying changes in the data source therefore instantly affected the visualization. Google Charts and Maps were an effective tool for the interactive visualization of the two data sets. Both Google tools provided a range of toolsets from entry-level usage without or minimal programming skills up to complex usage scenarios. Interactive reporting dashboards, which allow practitioners to explore the data or to layer information, provide a progression from static, image based data visualizations. In particular the web-based approach and the separation of data and presentation layer provide opportunities for data visualization. The use of these

or similar tools should be encouraged to support timely dissemination and quick interpretation of surveillance data to improve the use of such data for veterinary public health action.

Antimicrobial use and resistance

P27: Risk factors for antimicrobial resistance in *E. coli* from pigs receiving oral antimicrobials - a systematic review

Elke Burow, A. Käsbohrer*

Orally administered antimicrobials increase antimicrobial resistance (AMR) in *Escherichia coli (E. coli)* from pigs which can be reservoirs of resistance genes transferable to other pathogenic and zoonotic bacteria. Since antimicrobials are important for therapy of infections of animals and humans, it is important to find critical and protective management factors around oral administration to reduce resistance development in *E. coli*. Therefore, the aim of this literature review was to identify risk factors for AMR development and spread in commensal *Escherichia coli (E. coli)* from pigs receiving antimicrobial treatment. Relevant explorative studies were searched according to keyword combinations from the electronic data bases DIMDI and additionally separately PubMed and Web of Science during May and June 2014. Identified studies were assessed against the eligibility criteria full paper available, defined risk factors besides antimicrobial usage by itself, administration and resistance evaluation, report of odds ratio or prevalence of resistance. Eleven articles were finally assessed, whereof 8 were on observational and three on experimental studies. Impact on AMR development was shown - beside oral antimicrobial use - for dosage, time-span between treatment and sampling, treatment incidence rate, herd size, season, farmer's time in pig barns, handling of sick pigs, intake of antimicrobials by farm residents, distance to another farm, production phase, visitors pig contact in last 2 days. The risk of bias was 'low' and 'unclear or low' for most information from observational and experimental studies. However, random selection and blinding of outcome assessment were often 'unclear' or at 'high' risk of bias. Treatment management and management practice have the potential to reduce the risk for AMR in *E. coli* from pigs. Further studies on effect of specific management practice are needed to develop well-based management advice.

P28: Prevalence of antimicrobial resistant *Escherichia coli* and quantification of integrons in bovine slaughterhouse effluents

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Cattle are a reservoir of antibiotic resistant *E. coli* strains. However, little information is available concerning the prevalence of these resistant strains in slaughterhouse sewage. The aim of this study was to evaluate the prevalence of antibiotic resistant *E. coli* in bovine slaughterhouse effluents, and to quantify class 1 resistant integrons (RIs). Effluents of two French slaughterhouses were sampled: plant A, which only slaughtered adult cattle, and plant B which only slaughtered calves. Four types of samples have been taken: wastewater, treated effluent, circulating sludge and sludge before land application. The susceptibility for 16 different antibiotics of forty *E. coli* isolates per sampling point was investigated and detection of class 1, 2 and 3 RIs has been performed by RT PCR on these strains. Moreover, total DNA was extracted from influents and effluents and class 1 RIs were quantified using qPCR and normalized to the 16S RNA-encoding DNA gene copy number in order to obtain the relative abundance of class 1 RIs.

Treatment in the WWTP eliminated about 99% of the *E. coli* load in the inlet effluents. However, up to 10^2 CFU/mL *E. coli* were released into the river, and up to 10^5 CFU/mL *E. coli* were present in sludge before land application. The percentage of *E. coli* resistant to at least one antibiotic was significantly higher in plant B (90.6%) than in plant A (10.0%) ($p<0.05$). 48.1% of *E. coli* strains from plant B were resistant to at least five antibiotics. 57.5% of *E. coli* strains from plant B harbored a class 1 integron, versus 0.0% for those from plant A. Wastewater treatment had no selective effect on percentages of resistant and integron-carrying *E. coli* isolated in effluents from both slaughterhouses.The relative abundance of class 1 RIs in wastewater was 0.083 and 0.040 for plant A and plant B respectively and 0.016 and 0.018 after treatment.

P29: Influence of a porcine circovirus type 2 vaccination programme on antimicrobial consumption at farm level

Johannes Raith, M. Trauffler, K. Lebl, C. Schleicher, J.Köfer*

The usage of antimicrobials in livestock is under growing criticism, primarily in response to the increasing phenomenon of drug resistant bacteria. The relationship between antimicrobial use in farm animals and the occurrence of antimicrobial resistance is not fully examined and there are still open questions. However, inappropriate and increased antimicrobial consumption is considered as one of the main risk factors for the development and spread of resistant bacteria. One strategy to reduce the antimicrobial consumption is an increased support of preventive measures. This study focused on the introduction of porcine circovirus type 2 (PCV2) vaccines and we hypothesised that the vaccination programme has been a successful tool to reduce the antimicrobial consumption in pig farms. For that purpose drug application data from 65 conventional Austrian pig farms (47 farrow-to-finish and 18 fattening farms) with an overall amount of 260,000 pigs were analysed in the period from 2008 to 2011. The PCV2 vaccination programme commenced in 2008 and the vaccination rate increased continuously in the covered population, reaching approximately 57% for farrow-to-finish and 98% for fattening farms in 2011. In the same period the administered amount of antimicrobials ("number of animal daily doses" (nADD) per kg biomass per year) declined by one third (median values on farm level) in farrow-to-finish and by more than two thirds in fattening farms. In order to investigate the influence of the increasing PCV2 vaccination rate on the antimicrobial consumption, a linear mixed model was applied. The results demonstrate a significant reduction of applied nADD in fattening farms, as a consequence of PCV2 vaccination. In farrow-to-finish farms only a negligible effect was detectable. The retrospective evaluation of preventive measures is of essential economic interest. In the context of a demanded reduction of antimicrobial use it can also be a valuable tool for setting corrective measures in the future.

P30: Benchmarking of animal welfare quality as a tool for reducing antimicrobial resistance

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The "EFFORT" project is initialized by the Seventh Framework Program (FP7) of the European Commission.
The aim of the collaborative project is the monitoring and reduction of antimicrobial resistance along the food production chain, including food animals, their environment and the risk exposure to humans. The increasing resistance of bacteria to antimicrobial drugs has become a major threat to human and animal health worldwide. Therefore, there is a need to analyze the epidemiology and mechanisms of

the emergence and spread of antimicrobial resistance especially in the food chain. EFFORT includes twenty research institutes of ten European countries, sampling six different animal species for this purpose.
The use of antimicrobial substances in general and the inappropriate use in particular increase the emergence and spread of resistant micro-organisms. This leads to a limited therapeutic value of antimicrobial drugs, resulting in difficulties to treat infections, extra suffering and mortality – decrease the health and welfare status of the herd or flock. This fact shows the necessity and importance of health and welfare indicators. Most existing scores, e.g. the scoring system of the FP6 - WELFARE QUALITY Project or the Herd Health Score (DICKHAUS, 2006), focus on pathological findings at slaughter house level to assess the health status of the herds and flocks. The collection of pathological findings is not jet standardized in all European countries, which makes it difficult to compare the scores, even between batches slaughtered in different abattoirs within one country. That is the reason, why our research group is developing a novel scoring method, using only data collected on-farm. Taking into account the biosecurity status and level of infectious pressure, the new score connects health status of food animal to the microbiological status of the environment, resulting in an easy to use on-farm tool.

P31: Quantification of antimicrobial usage in different animal species in Switzerland *(Poster tour)*

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The quantification of usage of different antimicrobial (AM) classes in different animal species is the basis to evaluate the contribution of animal AM usage to the evolution of AM resistance. Few countries have established a prescription based monitoring. In most European countries, solely statistics on total sales per AM class are available, without any information on the animal species. Considering this, new approaches are required to assess AM usage in animals. In Switzerland, sales data on a package level are available from 2006 onwards. The products licensed for a single animal species are easily attributed. For the ones which can be used in multiple species, five different repartition methods will be used and the results will be compared. For the first approach, the number of different animal species to which a certain product can be prescribed will be determined using the Swiss Veterinary Drug Compendium. The amount of product sold will then be equally distributed among the different species. For the second model, products will be apportioned per animal species taking into account the relative proportion of the total body mass of each species the AM is licensed for. Periodic Safety Update Reports (PSUR's) contain an estimate made by the Marketing Authorization Holders (MAH) about the sales distribution per species. These data will be used for the third repartition model. Since PSUR's are only available every five years, for the fourth model MAH will be consulted to provide an estimate of the product distribution per species. Finally, for the last approach, a Bayesian method will be implemented, with the aim to distribute each product per animal species based on prescription data generated from a previous field study (2004-2005). The results of this study might provide new alternatives enabling the quantification of veterinary AM usage per animal species.

P32: Antimicrobial consumption in 75 Austrian pig farms: Evaluation of electronic on-farm records

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Detailed data about the antimicrobial use in animal husbandry, including information about the diagnosis or the animal age class, can be provided by the end-user such as the farmer. Unfortunately, these sources are rarely standardised and are reputed to be inefficient. The aims of this study were (1) to collect on-farm drug application data, (2) to verify the quality of such data, and (3) to estimate the antimicrobial consumption in pig farms using four different units of measurement. For that purpose, electronic drug application records from farmers from 75 conventional pig farms out of Styria (Austria) in the time frame from 2008 until 2011 were intensively checked for their plausibility and quality. In order to control the drug amount correctness, each single drug package/flagon was labelled with an individual serial number in the course of drug dispensary. The farmer also registered this serial number during drug application recording, which made comparisons between the drug amounts (farmers' records and veterinarians' dispensary records) possible. The annual antimicrobial use was expressed in weight of active substance(s), number of Used Daily Doses (nUDD), number of Animal Daily Doses (nADD) and number of Product-related Daily Doses (nPrDD). Results were referred to the animal bodyweight (kg biomass). The data plausibility proof revealed about 14% of unrealistic entries. In 57% of records, accordance between the dispensed and the applied drug amount was detected. The annual antimicrobial consumption was on average 33.9 mg/kg/year; 4.9 UDD_{kg}/kg/year; 1.9 ADD_{kg}/kg/year; and 2.5 $PrDD_{kg}$/kg/year. Metaphylactic or prophylactic measures constituted the main indications for antibiotic use in farrow-to-finish and fattening farms. The proportion of the "highest priority critically important antimicrobials" was moderate and strongly influenced by the unit of measurement. The UDD/ADD ratio showed that orally administered antimicrobials were mostly under-, parenterally administered antimicrobials rather correctly or overdosed.

P33: Antimicrobial resistance: what measures should we use?

R.W. Humphry, Sue C. Tongue, J. Evans, C. Webster, G. Foster, G.J. Gunn*

Antimicrobial resistance (AMR), with respect to bacterial infections in particular, is an issue of increasing importance globally which threatens a return to the pre-antibiotic era. Surveillance of AMR is an important tool in tackling this problem, however, coordination and harmonisation of methods at a European, and in many cases national, level is lacking currently. There have been numerous calls to improve surveillance for AMR ... but what is it that we are attempting to measure, or detect, through such surveillance and what measures should we use? We explore this question, making use of a small study in which we compare three methods of measuring or detecting AMR. In Scotland, *E. coli* recovered from faecal samples from cattle and sheep, submitted for parasitological monitoring, are used to routinely monitor the existence of AMR to certain antibiotics by disc diffusion methods according to the methodology of the British Society for Antimicrobial Chemotherapy (BSAC). To the same samples we have applied both minimum inhibitory concentration (MIC) testing of individual isolates, and a sample-level method used in a Scotland-wide survey of AMR in healthy sheep and cattle from over a decade ago – a modified Amyes method. These three measures represent the same concept: "resistance", however, by cross-testing on the same samples we are able to demonstrate empirically that they are not the same. This is because they actually measure different aspects of the general concept we call "resistance". For effective surveillance we need to carefully define what it is

that we wish to measure and whether or not on-going monitoring, or future repeat measurement, may be required; then, employ the most appropriate available measure for the job in hand. The first stage in the process is to acknowledge that the different methods provide very different metrics for describing AMR.

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